

Remarks

Applicants have amended Claims 1 and 2. Applicants respectfully submit no new matter has been added by the present amendment.

Claim Objection

Claims 1 and 2 stand objected to because of informalities. Applicants have amended Claims 1 and 2 as suggested in the Office Action and accordingly request withdrawal of this ground of objection.

Claim Rejection under 35 U.S.C. § 102(a)

Claims 1-4 stand rejected under 35 U.S.C. § 102(a) as being anticipated Saito et al. (EP 1153972). Applicants respectfully traverse this ground of rejection.

Applicants submit to anticipate a claim, the cited references must teach each and every element of the claimed invention, either explicitly or inherently. Applicants submit the present invention is directed to branched and coupled polymers based on conjugated dienes or on conjugated dienes and vinylaromatic compounds and on polyfunctional, organic compounds having at least 4 groups which are capable of coupling. Further the present invention provides that the amount of polymer with at least 4-fold branching is greater than the amount of polymer with 3-fold branching. Further, according to the present invention, in order to obtain branched and coupled polymers with excellent processing properties and physical and dynamic properties as claimed, a high degree of branching is claimed.

Applicants submit Saito et al. does not teach each and every element of the claimed invention. Saito et al. discloses diene rubbery polymers which are modified by a polyfunctional compound having at least 2 epoxide groups in an amount exceeding 60% based on the polymer. See Paragraph 17.

Applicants submit one skilled in the art would understand "modification" does not have the same meaning as "branching." Modification of a polymer chain means the introduction of a functional group with an insignificant change in the molecular weight which cannot be measured. Branching means the connecting of at least three polymer chains at a central point (branching point) with each other in a way that the architecture of the resulting polymer chain is star-like. The molecular weight of the resulting polymer chain is the sum of the molecular weights of connected chains. The connection of only two polymer chains at their chain ends does not give a branched (star-like) polymer chain but a linear one.

As noted in the Examples of the present invention, when at least 60% of the coupled polymer has a degree of branching greater than 2, with the proviso that the amount by weight of the polymers with 4 and more than 4-fold branching is always greater than the amount by weight of polymers with 3-fold branching, the polymers have excellent physical properties such as, for example, low rolling resistance.

Applicants Saito et al. does not disclose polymers with the claimed branching, i.e., degree of branching greater than 2 for at least 60% of the coupled polymers with the proviso that the amount by weight of the polymers with 4 and more than 4-fold branching is always greater than the amount by weight of polymers with 3-fold branching.

Further, Applicants submit that Referential Example 2 of Saito et al. does not result in a polymer with the claimed branching, as in the present invention. While a tetrafunctional compound can lead to branching, branching only happens when three or four polymer chains react with one molecule of the tetrafunctional compound. The average number of polymer chains reacting with one molecule of tetrafunctional compound depends on the molecular ratio tetrafunctional compound/polymer chains. If this ratio is high there is a surplus of the tetrafunctional compound. This means that only few tetrafunctional molecules react with three or four polymer chains, i.e., the amount of branching is low. A low ratio tetrafunctional compound/

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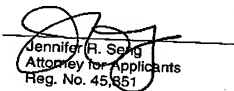
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polymer chain on the other hand gives a high amount of branching. The referential Example 2 of Saito et al. uses a ratio tetrafunctional compound/polymer chains of 0.9. As this ratio is close to 1, this means that most of the tetrafunctional molecules react with only one polymer chain. And, the reaction of one tetrafunctional compound with one polymer chain does not give branching, but modification (as discussed above). With such a ratio branching may occur, but only a low amount of the tetrafunctional molecules leads to branching. In other words: With such a ratio, modification is the main reaction and branching is the side reaction. And, as claimed in the present invention, the polymers have a degree of branching greater than 2 with the proviso that the amount by weight of the polymers with 4 and more than 4-fold branching is always greater than the amount by weight of polymers with 3-fold branching and, as discussed herein, the modified polymers of Saito et al. do not disclose the claimed branching.

Therefore, Applicants submit Saito et al. fails to teach each and every element of the claimed invention and accordingly, Applicants request withdrawal of this ground of rejection.

Respectfully submitted,

By


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